CLAIMS

What is claimed is:

1. A method for determining edge voxels, comprising the steps of:

calculating a gradient for each of a plurality of voxels by determining a maximum absolute gradient component relative to each adjacent voxel; and

identifying one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

2. The method as recited in claim 1, wherein each adjacent voxel comprises twenty-six adjacent voxels.

3. A computer program, provided on one or more computer readable media, for gating image data, comprising:

a routine for calculating a gradient for each of a plurality of voxels, wherein the routine for calculating determines a maximum absolute gradient component relative to each adjacent voxel; and

a routine for identifying one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

4. An imaging system, comprising:

an imager configured to generate a plurality of signals representative of one or more structures within a volume of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to process the plurality of signals, wherein the data processing circuitry is further configured to calculate a gradient for each of a plurality of voxels corresponding to the volume of interest by determining a

maximum absolute gradient component relative to each adjacent voxel and to identify one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry; and

an operator workstation configured to communicate with the system control circuitry and to receive the plurality of signals from the data processing circuitry.

5. An imaging system, comprising:

means for calculating a gradient for each of a plurality of voxels by determining a maximum absolute gradient component relative to each adjacent voxel; and

means for identifying one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

6. A method for segmenting a structure, comprising the steps of:

iteratively merging one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration;

iteratively updating a queue of candidate voxels each iteration based upon the new seed voxels; and

terminating the iterative processes to generate a segmented structure comprising the foreground region.

7. The method as recited in claim 6, wherein at least one of the dynamic constraints is updated based on at least one of a cross section of the region and a local statistic of the region.

8. The method as recited in claim 6, wherein terminating the iterative process occurs when the queue of candidate voxels is substantially empty.

9. The method as recited in claim 6, further comprising selecting an initial set of seed voxels using one or more templates.

10. A computer program, provided on one or more computer readable media, for segmenting a structure, comprising:

a routine for iteratively merging one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration;

a routine for iteratively updating a queue of candidate voxels each iteration based upon the new seed voxels; and

a routine for terminating the iterative process to generate a segmented structure comprising the foreground region.

11. The computer program, as recited in claim 10, wherein the routine for iteratively merging updates at least one of the dynamic constraints based on at least one of a cross section of the region and a local statistic of the region.

12. The computer program, as recited in claim 10, wherein the routine for termination terminates the iterative processes when the queue of candidate voxels is substantially empty.

13. The computer program as recited in claim 10, further comprising a routine for selecting an initial set of seed voxels using one or more templates.

14. An imaging system, comprising:

an imager configured to generate a plurality of signals representative of one or more structures within a volume of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to process the plurality of signals, wherein the data processing circuitry is further configured to iteratively merge one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration, to iteratively update a queue of candidate voxels each iteration based upon the new seed voxels, and to terminate the iterative process to generate a segmented structure comprising the foreground region;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry; and

an operator workstation configured to communicate with the system control circuitry and to receive the plurality of signals from the data processing circuitry.

15. The imaging system as recited in claim 14, wherein the data processing circuitry updates at least one of the dynamic constraints based on at least one of a cross section of the region and a local statistic of the region.

16. The imaging system as recited in claim 14, wherein the data processing circuitry terminates the iterative processes when the queue of candidate voxels is substantially empty.

17. The imaging system as recited in claim 14, wherein the data processing circuitry is further configured to select an initial set of seed voxels using one or more templates.

18. An imaging system, comprising:

means for iteratively merging one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration;

means for iteratively updating a queue of candidate voxels each iteration based upon the new seed voxels; and

means for terminating the iterative processes to generate a segmented structure comprising the foreground region.

19. A method for identifying a structure of interest, comprising the steps of:

providing at least one of a geometrical template and a functional template, wherein each template represents at least one characteristic of a structure of interest; and

identifying one or more regions of the structure of interest based upon the similarity of the respective characteristic in the regions and the provided templates.

20. The method as recited in claim 19, wherein the geometrical template comprises a geometrical shape.

21. The method as recited in claim 19, wherein the functional template comprises at least one of a statistical homogeneity criteria, an intensity distribution, an intensity level, and a pattern.

22. A computer program, provided on one or more computer readable media, for identifying a structure of interest, comprising:

a routine for identifying one or more regions of a structure of interest based upon the similarity of one or more characteristics of the regions and one or more templates, wherein the templates comprise at least one of a geometrical template and a functional template and wherein each template represents at least one respective characteristic of the structure of interest.

23. An imaging system, comprising

an imager configured to generate a plurality of signals representative of one or more structures within a volume of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to process the plurality of signals, wherein the data processing circuitry is further configured to identify one or more regions of a structure of interest based upon the similarity of one or more characteristics of the regions and one or more templates, wherein the templates comprise at least one of a geometrical template and a functional template and wherein each template represents at least one respective characteristic of the structure of interest;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry; and

an operator workstation configured to communicate with the system control circuitry and to receive the plurality of signals from the data processing circuitry.

24. An imaging system, comprising:

means for providing at least one of a geometrical template and a functional template, wherein each template represents at least one characteristic of a structure of interest; and

means for identifying one or more regions of the structure of interest based upon the similarity of the respective characteristic in the regions and the provided templates.

25. A method for automatically segmenting a structure from a set of image data, comprising the steps of:

selecting one or more initial regions corresponding to a structure of interest from a volume data set;

generating an edge map from the volume data set; and

iteratively segmenting the structure of interest using at least the one or more initial regions and the edge map, wherein the segmentation is based upon one or more dynamic constraints.

26. The method as recited in claim 25, wherein generating the edge map comprises:

calculating a gradient for each of a plurality of voxels of the volume data set by determining a maximum absolute gradient component relative to each adjacent voxel; and

identifying one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

27. The method as recited in claim 25, wherein iteratively segmenting the structure of interest comprises:

iteratively merging one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on the one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration;

iteratively updating a queue of candidate voxels each iteration based upon the new seed voxels; and

terminating the iterative processes to generate a segmented structure comprising the foreground region.

28. The method as recited in claim 27, wherein at least one of the dynamic constraints is updated based on at least one of a cross section of the region and a local statistic of the region.

29. The method as recited in claim 27, wherein terminating the iterative processes occurs when the queue of candidate voxels is substantially empty.

30. The method as recited in claim 27, further comprising selecting an initial set of seed voxels using one or more templates.

31. The method as recited in claim 25, wherein selecting one or more initial regions comprises:

providing at least one of a geometrical template and a functional template, wherein each template represents at least one characteristic of the structure of interest; and

identifying one or more regions of the structure of interest based upon the similarity of the respective characteristic in the regions and the provided templates.

32. The method as recited in claim 31, wherein the geometrical template comprises a geometrical shape.

33. The method as recited in claim 31, wherein the functional template comprises at least one of a statistical homogeneity criteria, an intensity distribution, an intensity level, and a pattern.

34. A computer program, provided on one or more computer readable media, for automatically segmenting a structure from a set of image data, comprising:

a routine for selecting one or more initial regions corresponding to a structure of interest from a volume data set;

a routine for generating an edge map from the volume data set; and

a routine for iteratively segmenting the structure of interest using at least the one or more initial regions and the edge map, wherein the segmentation is based upon one or more dynamic constraints.

35. The computer program as recited in claim 34, wherein the routine for generating calculates a gradient for each of a plurality of voxels of the volume data set by determining a maximum absolute gradient component relative to each adjacent voxel and identifies one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

36. The computer program as recited in claim 34, wherein the routine for iteratively segmenting the structure of interest iteratively merges one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on the one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration, iteratively updates a queue of candidate voxels each iteration based upon the new seed voxels, and terminates the iterative processes to generate a segmented structure comprising the foreground region.

37. The computer program as recited in claim 36, wherein the routine for iteratively segmenting updates at least one of the dynamic constraints based on at least one of a cross section of the region and a local statistic of the region.

38. The computer program as recited in claim 36, wherein the routine for iteratively segmenting terminates the iterative processes when the queue of candidate voxels is substantially empty.

39. The computer program as recited in claim 34, wherein the routine for selecting identifies one or more regions of the structure of interest based upon the similarity of one or more characteristics of the regions and one or more templates, wherein the templates comprise at least one of a geometrical template and a functional template and wherein each template represents at least one respective characteristic of the structure of interest.

40. An imaging system, comprising:

an imager configured to generate a plurality of signals representative of one or more structures within a volume of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to process the plurality of signals, wherein the data processing circuitry is further configured to select one or more initial regions

corresponding to a structure of interest from a volume data set, to generate an edge map from the volume data set, and to iteratively segment the structure of interest using at least the one or more initial regions and the edge map, wherein the segmentation is based upon one or more dynamic constraints;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry; and

an operator workstation configured to communicate with the system control circuitry and to receive the plurality of signals from the data processing circuitry.

41. The imaging system as recited in claim 40, wherein the data processing circuitry generates the edge map by calculating a gradient for each of a plurality of voxels of the volume data set by determining a maximum absolute gradient component relative to each adjacent voxel and by identifying one or more edge voxels from the plurality of voxels based upon a comparison of the gradients of each of the plurality of voxels to a threshold edge gradient.

42. The imaging system as recited in claim 40, wherein the data processing circuitry iteratively segment the structure of interest by iteratively merging one or more candidate voxels into a foreground region comprising at least one or more seed voxels, wherein the candidate voxels are merged based on the one or more dynamic constraints and wherein the merged candidate voxels become the seed voxels for the next iteration, iteratively updating a queue of candidate voxels each iteration based upon the new seed voxels, and terminating the iterative processes to generate a segmented structure comprising the foreground region.

43. The imaging system as recited in claim 42, wherein the data processing circuitry is configured to update at least one of the dynamic constraints based on at least one of a cross section of the region and a local statistic of the region.

44. The imaging system as recited in claim 42, wherein the data processing circuitry is configured to terminate the iterative processes when the queue of candidate voxels is substantially empty.

45. The imaging system as recited in claim 40, wherein the data processing circuitry selects one or more initial regions by identifying one or more regions of the structure of interest based upon the similarity of one or more characteristics of the regions and one or more templates, wherein the templates comprise at least one of a geometrical template and a functional template and wherein each template represents at least one respective characteristic of the structure of interest.

46. An imaging system, comprising:

means for selecting one or more initial regions corresponding to a structure of interest from a volume data set;

means for generating an edge map from the volume data set; and

means for iteratively segmenting the structure of interest using at least the one or more initial regions and the edge map, wherein the segmentation is based upon one or more dynamic constraints.